under the bottom wire Range water developments benefit wildlife by providing water where none existed before (as in guzzler improvements) or by making the water more accessible (troughs and ponds). Stock tanks can be a trap for small animals, so escape ramps are provided

The existence and production of wildlife is directly related to habitat quality and quantity. Habitat improvement projects are designed to either maintain or increase the dispersal or populations of a given species. The Forest has the potential to improve habitat conditions for a wide variety of wildlife species But an improvement project for one species may be a detriment to another

Developed and dispersed recreation facilities may adversely affect wildlife, fisheries, or sensitive plants when located in riparian areas, big-game winter ranges, or in habitats used by threatened, endangered or sensitive species The facilities and their use by people discourage use of these areas by many wildlife species. Location of recreation sites in areas favored by wildlife, such as riparian zones, can increase the impact on wildlife species. Habitat losses from facility development include loss of ground cover, snag trees, downed, woody material, and burrowing animal habitat due to compaction and human disturbance

Each year on the Forest, recreational hunting results in the harvest of deer, elk, bear, cougar, and grouse Harvest levels are managed by the Oregon Department of Fish and Wildlife

The management of scenery is often compatible with wildlife management goals Vegetation diversity promotes visual variety and produces forage for wildlife Riparian areas, cliffs, rims, caves and talus slopes, snags, large, old trees, and openings are often visually attractive and they also provide a home for wildlife

Wilderness designation protects existing wildlife habitats from human modification and leaves them vulnerable to natural modification The wilderness areas provide spring, summer, and fall habitat for mule deer and Rocky Mountain elk During big-game hunting seasons, the wildernesses provide escape areas for bucks and bulls. Bear, coyote, and cougar also inhabit the areas Pileated woodpecker, pine marten, and other species which utilize old growth also occur in the areas

Minerals exploration and development often interfere with wildlife use patterns Migration, mating, and parturition habits may be disturbed Mining-related road construction and development result in at least temporary loss of habitat for some species Development of rock quarries is particularly threatening to wildlife which depend on talus slopes and cliffs Conversely, abandoned mine shafts do provide some of the habitat needs of cave-dwelling species

Increasing tree cover as a result of fire suppression has changed ground vegetation Pinegrass and elk sedge, two common native plants, decrease with increasing fir-tree cover. On the other hand, low-intensity fires may have a detrimental effect on bitterbrush and sagebrush, key winter forage species

4 Fisheries

The Malheur National Forest contains a highly diversified fishery resource ranging from coldwater-dependent cutthroat and bull trouts to cool-water smallmouth bass. In addition, the John Day River drainage supports anadromous runs of Columbia River spring Chinook salmon and summer steelhead trout Fisheries habitat ranges from cold, high-elevation headwater streams and lakes to extreme low-flow or intermittent streams in which summer daily maximum water temperatures exceed 80° Fahrenheit.

The Forest encompasses parts of the following major drainages.

North Fork John Day River. Except for the Middle Fork of this river, only headwater areas of a few tributaries to the North Fork reach the Malheur National Forest These Forest streams do contribute somewhat to the resident trout sport fishery, but they are all above the distribution limits of anadromous fish

Middle Fork John Day River: The Middle Fork is a tributary to the North Fork John Day River and supports anadromous runs of spring Chinook salmon and summer steelhead trout as well as resident rainbow/redband trout populations Bull trout are also present in some of the colder tributaries Over half the Middle Fork is on private land But from Big Creek upstream, most of the tributaries are mostly on Forest lands Thus, about 88 percent of the steelhead production in the Middle Fork is on the Forest It is estimated that about 70 percent of the Chinook spawning occurs on the Forest, but again the tributaries add to the relative importance of Forest streams by providing summer rearing for juvenile chinook, which move into these tributaries when water temperatures in the Middle Fork become too warm

Main Stem John Day River: The main stem supports anadromous runs of spring Chinook salmon and summer steelhead trout as well as resident rainbow/redband trout, cutthroat trout, bull trout, and brook trout Only a small part of the main stem is on the Forest, but a major portion of the headwater tributaries are within the Forest boundary Thus, only about 15 percent of the chinook production in the main stem occurs on the Forest, but about 67 percent of the steelhead production is on the Forest

South Fork John Day River· The South Fork supports a run of summer steelhead up to river mile 28, where an impassable barrier exists A major portion of the west-flowing tributaries to the South Fork are within the Forest boundary, which includes about 38 miles of steelhead streams The Izee Falls are located on BLM land, downstream from the Forest. A fish-passage project is planned for these falls If completed, this will provide steelhead access to about 85 miles of stream, 26 miles of which are on the Forest. The South Fork and its tributaries also support a rainbow/redband trout sport fishery

Malheur River (Main Stem and North Fork). The Malheur River is a tributary of the Snake River and formerly supported an anadromous fishery. This fishery was eliminated in the first half of this century by high dam construction on the Snake River. The river system currently supports a resident trout fishery (bull trout, rainbow/redband trout, and brook trout).

Silvies River: The Silvies River flows into the Harney Basin, which has no outlet and acts as a drying basin The drainage supports a resident trout fishery and the only smallmouth bass fishery on the Forest

The potential annual supply of anadromous fish from the Malheur National Forest, expressed as Smolt Habitat Capability Index, is 505,000 smolt by the end of the 50-year planning period This could provide a commercial harvest of nearly 82,000 pounds of fish and a sport fishery of over 60,000 wildlife-and-fish user-days annually. But realizing this potential would involve a moderately-high investment in fish habitat improvements and substantially reduced timber and range outputs

The demand for Chinook salmon and steelhead trout in the Columbia River Basin exceeds supply Extensive efforts are underway along the Pacific Coast to increase the number of anadromous fish available for harvest Commercial fishing operators have experienced decreased catches, shorter seasons, and increased costs. Major court battles have been fought over allocation of ever-dwindling fish stocks between Indian and non-Indian harvest groups Legislation has been passed establishing a 200-mile offshore economic zone to decrease pressure on stocks already depleted by foreign fishing vessels (Report of the Salmon and Steelhead Advisory Commission, July 1984) Sport-fishing seasons for Chinook salmon have been canceled or reduced in many areas due to declining runs. The sport-fishing season for Chinook salmon on the John Day River has been closed since

1977. The increased production achievable on the Forest is a very small percentage of the total increase necessary in the entire Columbia River Basin to meet demand. But any increase in production resulting from National Forest management would be used.

The supply of resident fish-angling opportunities greatly exceeds existing demand Within the planning period, it is unlikely that demand will exceed supply

a *Relationship Between Forest Management and Fish*

Both water temperature regulation and instream organic material provided by trees are important to fish habitat quality Water temperature regulation is discussed under "Water" (see section 5) When a tree falls across a stream it may trap debris and form a small natural dam As water plunges over this dam a pool is scoured out, providing a deep, cool resting place for rearing fish. Good quality spawning gravels with plenty of subsurface water flow for good survival of incubating fish eggs are often found below these scour pools In addition, many invertebrates, which are a source of food for fish, live on large woody material in the stream

If the importance of shade and instream organic material is not accounted for in timber harvest activities, adverse short-term and long-term effects can result The removal of shade is an immediate effect that will last until the remaining, or regenerated stand, provides shade again. The removal of a source of large woody material for the stream channel has a long-term effect, which may not be immediately noticeable. Therefore, the fish habitat management objectives for timber management are to maintain shade and provide for recurring input of large woody material for the stream channel

The greatest effects of livestock management on fish habitat are the removal and suppression of riparian vegetation, especially deciduous woody vegetation. This also applies to big game use of riparian areas Woody riparian vegetation is important as fish habitat for several reasons It provides shade, which helps regulate water temperature, and the root systems maintain bank stability

Shrubs growing along the streambank also provide overhead cover (hiding cover) for fish because some of the branches hang over, or may be partially under, the water Over half the food supply for fish in streams is terrestrial in origin, and deciduous woody vegetation is more productive than conifer or grass/forb vegetation types as a source of fish food.

Both big-game and livestock animals can have an adverse impact on fish habitat by breaking down the streambanks, thus reducing overhead cover for fish (undercut banks), decreasing channel stability, and increasing sedimentation

Range management objectives in riparian areas include protection of woody vegetation, and recovery of this vegetation in areas where it has been reduced by past management activities Different strategies are used to achieve recovery in varying time frames

Beavers and their dams can have positive and negative effects. In some unusual cases, beaver dams could form upstream fish migration barriers which would be detrimental for anadromous fish No such barriers have been identified on the Forest. Beneficially, beaver ponds form additional aquatic habitat which is often very productive for fish rearing These ponds have been found to be particularly beneficial for some species of salmon

Fish populations are directly tied to water quantity, water quality, and the health and vigor of the riparian community But water has other beneficial uses which are often inconsistent with fish production. Demand for irrigation water and other uses occasionally makes it difficult to maintain instream flows

Stream discharge in the John Day Basin is marked by extreme variability in both timing and quantity The problem is not restricted to the main stem John Day, as tributaries

to the system also have low flows during late summer Headwater streams on the Forest will have perennial flow but are diverted to supply irrigation needs off-Forest Some of these streams where this occurs are used by steelhead for spawning. As stream flows are reduced, rearing habitat and juvenile fish are lost. Migration barriers are also created for those fish which try to move into the cooler tributaries from the warmer water temperatures of the larger streams As the flow in higher elevations of the tributaries decreases during late summer, fish will tend to move downstream where there is more flow. If stream flows are reduced on the lower reaches, both downstream and upstream migration is hindered.

Recreational fishing can reduce populations of wild fish, thus creating a need to supplement with hatchery fish. Reducing populations of sensitive species could result in their listing as "threatened or endangered "

Developed recreation sites in riparian areas often result in loss of fisheries habitat. This is due to a number of factors including· (1) bank protection placed to reduce loss of campground areas, and (2) felling and removal of dead wood for recreationist safety and for firewood

Fish habitat management and visual resource management are generally compatible. Because such management also maintains more large, old trees in the timber stand, it provides more source material for instream woody debris than other timber management systems.

The high quality of water from the wilderness areas is beneficial to downstream fisheries. Streams flowing into the upper John Day River drainage support rainbow/redband, cutthroat, and bull trout Streams draining into the North Fork Malheur River and Malheur River support native rainbow/redband and bull trout.

When mineral exploration and development occurs, it usually involves surface or stream gravel-disturbing activities Those activities with the most influence on the fishery resource are suction dredging, road construction, vegetation removal, mineral extraction and processing, waste disposal, and reclamation projects

Suction dredging removes much of the plant life required by insects and may often destroy the insects themselves Since insects are a primary food for fish, such activities may result in displacement of fish until the activities are over Suction dredging may loosen or clean gravel, which could be beneficial, but the fines cleaned from one area will be deposited elsewhere and might be detrimental. It could cause sedimentation of spawning gravel and may cause suffocation of eggs or block emergence of fry. Loosening gravels may result in destruction of pools and upstream riffles, or it may create pools (Martin 1982).

Placer mining conducted out of the river could have additional effects on the fishery resource. Since this type of mining usually involves gravity concentration techniques, water chemistry is generally not changed but water quality could be because of added sediment and increased erosion Because vegetation is removed as part of the mining process, shade may be reduced and water temperatures may rise Vegetation removal may also result in increased erosion and sedimentation problems. Since placer deposits are associated with stream gravels, mining may result in temporary stream channel relocation and cause long-term channel or profile changes All would affect the fishery resource but with proper reclamation, fishery habitat can be restored or even enhanced

Hardrock and leasable mineral mining, milling, extraction, and transport operations may have similar effects on the fishery resource when located near streams, but this type of activity also has the potential to change water chemistry. Extreme precautions are taken to assure that this type of activity does not degrade the chemical characteristics of water and adversely affect the fishery resource.

Fire usually affects fish habitat only by removing vegetative cover In some cases, this may also increase erosion, thus decreasing water quality and adversely affecting fish habitat. Managed fire will generally not have much effect on riparian vegetation or water quality. Thus, the effects of prescribed fire on fish habitat will generally be insignificant.

Roads may have a number of direct and indirect effects on fish. (For a discussion about the effect of roads on fish, see Forest Service General Technical Report PNW-109 "*Planning Forest Roads to Protect Salmon Habitat*") Direct effects include: (1) blockage of upstream migration for resident and anadromous fish due to inadequate culverts and change in streamflow characteristics, and (2) reduction in quantity and quality of available fish habitat due to road location

Indirect effects are mostly due to water quality changes including (1) reduction in vegetative stream cover, (2) increases in sediment (as affected by road design, location and maintenance), and (3) utilization of chemicals on roads Road access disperses anglers and allows utilization of a greater amount of the resource

In wilderness and other unroaded areas, the effects of historical management activities may not be very obvious, but even here the evidence of many years of livestock grazing are apparent in some places In the roaded portions of the Forest, the effects of historical management activities are apparent in most streams and riparian areas The magnitude of these effects varies widely from stream to stream, but the following generalizations can be made Logging activities, including historical railroad logging and the road construction associated with modern timber harvest activities have occurred over most of the Forest Effects of livestock grazing are common Forest-wide, but are more pronounced in the southern part of the Forest than in the northern part Effects of mining activity are concentrated in the Middle Fork John Day River and its tributaries. Only a few streams on the Forest now have resident beaver on a long- term basis Beaver can also be found in some other streams temporarily, that is, for a few years at a time

5 Water

The rivers and streams of the Forest are a valuable resource in northeastern Oregon. These streams and rivers originate in, and flow through, productive and beautiful forests They provide high-quality water for spawning and rearing of anadromous fish, and habitat for resident trout and other native fish species Off-Forest water uses are also very valuable, domestic and industrial uses and irrigation of agricultural lands are the primary downstream uses

Intensive water quality monitoring started on the Forest in 1978 Water quality data has been collected from 41 water quality monitoring stations on 31 different streams Some of these stations have records for only 1 or 2 years while others have been monitored continuously, although at different intensity levels Most of the sampled streams were on the Long Creek Ranger District because it was within the proclaimed study area of the Oregon Range and Related Resources Evaluation Project (EVAL) Special project funding was received between 1978 and 1987 Publishing the results of this study, including the water quality reports, was the responsibility of the Forestry & Range Sciences Laboratory in La Grande, Oregon Water quality monitoring is continuing on the Forest on a limited basis. The water quality information now being collected is water temperature data for selected streams, and a reduced level of data collection for some of the original EVAL stations. Copies of the information are available for review at the Laboratory in LaGrande and at the Supervisor's Office in John Day

Climate, vegetation, and management activities will affect water resources on the Forest. A high desert climate with low precipitation and high summer temperatures results in low humidity and rapid evaporation The Forest's precipitation zones range from 20 inches at low elevations to 40 inches at high altitudes Climate records show great variability in when precipitation occurs and in what form